10.1071/FP16057_AC

Supplementary Material: *Functional Plant Biology*, 2016, 43(7), 620–631.

Supplementary Material

Insights into root structure and function of *Bassia indica*: water redistribution and element dispersion

Oren Shelef[A,F], *Paula Pongrac*[B], *Primož Pelicon*[C], *Primož Vavpetič*[C], *Mitja Kelemen*[C], *Merav Seifan*[D], *Boris Rewald*[A,E] *and Shimon Rachmilevitch*[A]

[A]The French Associates Institute for Agriculture and Biotechnology of Drylands, The Jacob Blaustein Institutes for Desert Research, Ben Gurion University of the Negev, Sde Boker Campus 84990, Israel.

[B]Department of Biology, Biotechnical Faculty, University of Ljubljana, Jamnikarjeva 101, SI-1000 Ljubljana, Slovenia.

[C]Jožef Stefan Institute, Jamova 39, SI-1000 Ljubljana, Slovenia.

[D]The Mitrani Department of Desert Ecology, The Swiss Institute for Dryland Environmental and Energy Research, The Jacob Blaustein Institutes for Desert Research, Ben Gurion University of the Negev, Sde Boker Campus 84990, Israel.

[E]Department of Forest and Soil Sciences, University of Natural Resources and Life Sciences, Vienna (BOKU), Peter-Jordan-Straße 82, 1190 Vienna, Austria.

[F]Corresponding author. Email: shelefo@bgu.ac.il

A

B

Fig. S1. (A) *Bassia indica* roots immediately after excavation from artificial salt gradient experiment. Note that coarse roots were firm enough to keep their initial posture after excavation. (B) *B. indica* roots in irrigated field in Sede Boqer campus, Israel. The plant was collected in an irrigated field growing in a Loess soil. In these conditions roots are likely to develop a single horizontal root as shown in this photo.

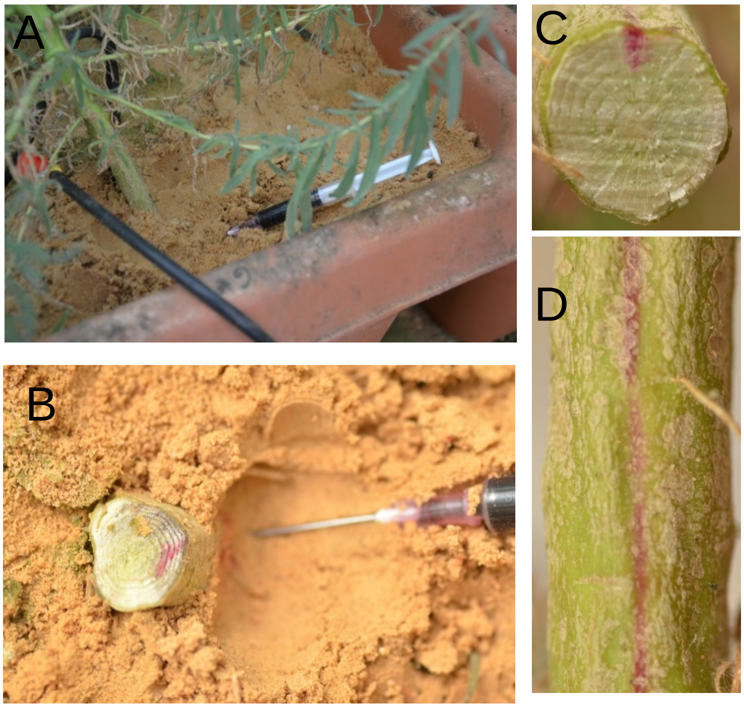


Fig. S2. Technique conducted to measure root/shoot staining distance ratio. (A) Syringe full with Safranin color 0.01% (w/v) affixed to root-shoot conjunction; (B) Red staining clearly appears in harvested shoot; (C) Stained shoot cross-section; (D) Stain along shoot.

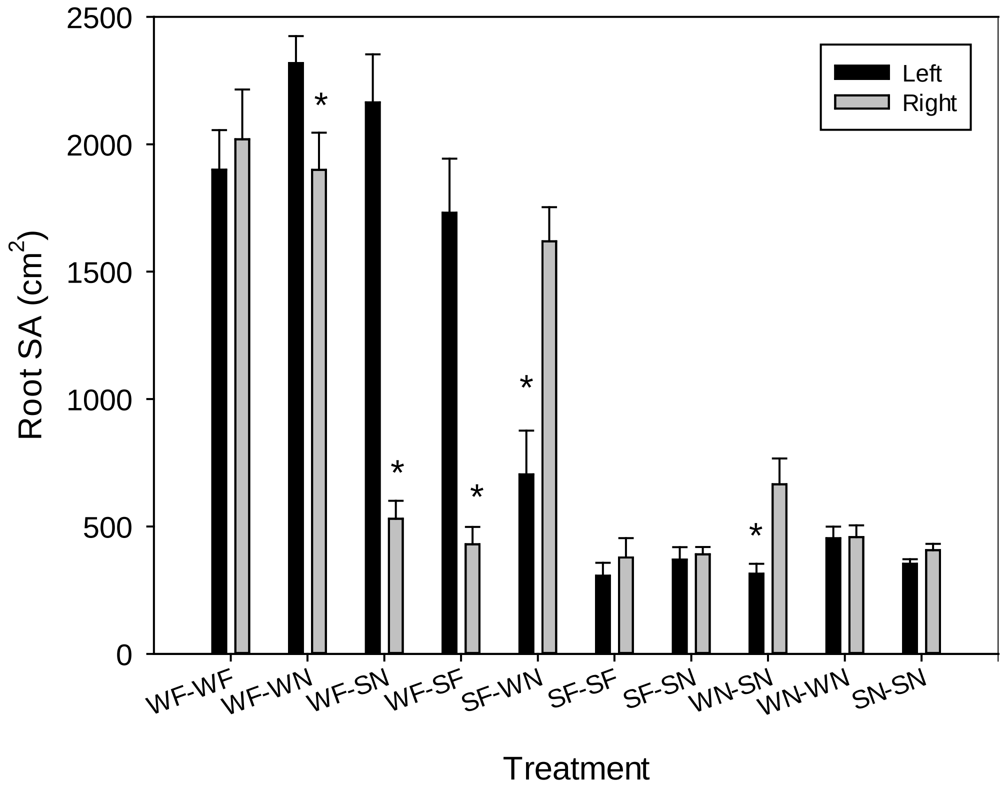
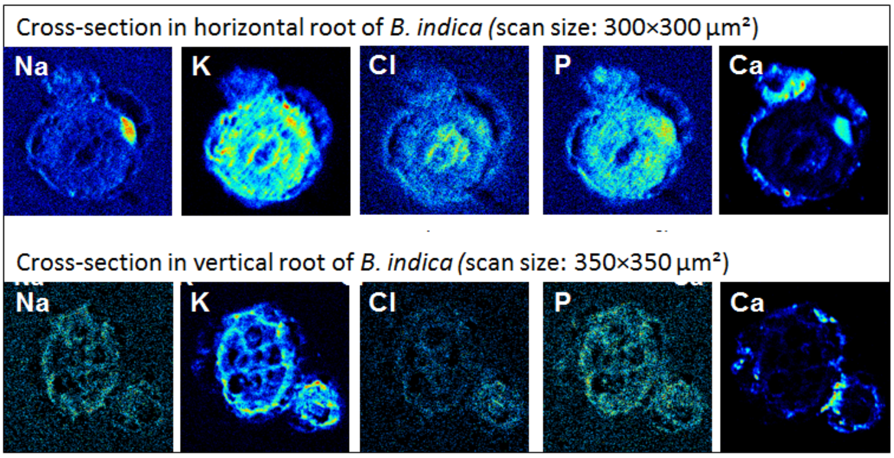


Fig. S3. Effects of nutrient and salinity on root growth (surface area, SA). Left (black bars) and right (gray bars) symbolize the dyad treatments of each split root system. W – fresh water-irrigated. S - saline water-irrigated (150 mM NaCl). F – fertilised. N – non-fertilised. As in the case of root development, combined effect of nutrient depletion and salinity was highly significant ($F_{9,86} = 28.49$; $P < 0.001$).



	Salt Vertical	Salt Horizontal	Water Vertical	Water Horizontal
Na	25.36 ± 3.07	27.04 ± 7.29	15.8 ± 2.45	16.64 ± 1.7
K	30.48 ± 1.12	33.05 ± 2.83	21.39 ± 1.13	56.55 ± 3.65
P	4.22 ± 0.71	3.99 ± 0.58	3.62 ± 0.69	5.77 ± 0.7
Cl	12.72 ± 1.64	8.01 ± 2.88	1.92 ± 0.49	6.12 ± 0.41
Ca	12.09 ± 2.45	16.97 ± 2.09	23.51 ± 2.32	17.64 ± 1.78
Fe	2.83 ± 0.52	4.12 ± 0.38	5.25 ± 0.48	3.87 ± 0.1
Zn	0.07 ± 0.01	0.12 ± 0.02	0.13 ± 0.01	0.14 ± 0.01
Mn	0.08 ± 0.02	0.1 ± 0.01	0.15 ± 0.01	0.11 ± 0.01
Cu	0.07 ± 0.02	0.1 ± 0	0.09 ± 0.02	0.09 ± 0.02

Fig. S4. Element dispersion along two different root types of a young *B. indica* plant. These plants were growing for only one month in an artificial salt gradient setup, as described in Shelef *et al.* (2010), similar to the artificial salt gradient described in methods in this study. The focal plant was taken from a salt treatment. Control fresh water treatment is not shown. Bright colors mark high concentrations of specified elements, though these maps are not quantitative and are not taking tissue thickness into account. However, quantitative analysis of these visual maps is summarized in the table below, where values represent mg g^{-1} DW ± se. These results revealed higher concentrations of Na, K, Ca, Fe, Zn, Mn and Cu in horizontal roots as compared to verticals (these cases are marked yellow in the table). Note accumulation of Na, Ca and P mainly in periphery and in a specific spot (maps). Orientation in relation to gravity is not known here. This observation led us to mark orientation to test if element hot spots are related to gravity and by this may cue antigravitropic growth.

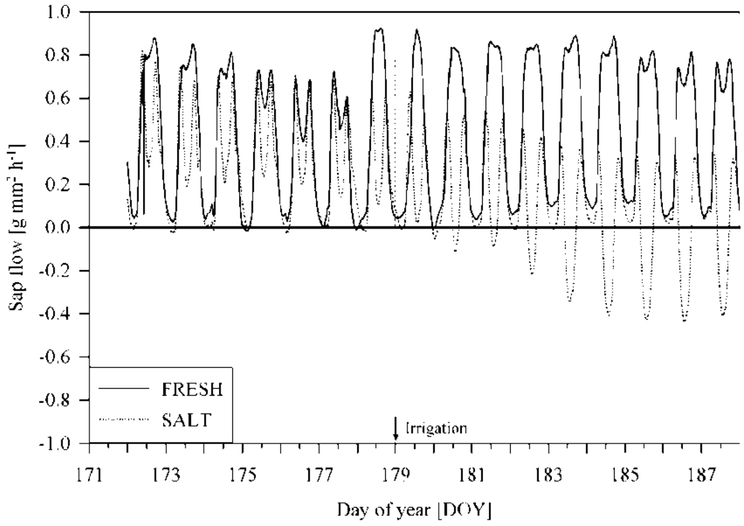


Fig. S5. Sap flow measurements were conducted with miniature heat balance-sap flow gauges on small-diameter mature roots (4.3±1.2 mm) for proof of concept. The miniature gauges technique (Coners and Leuschner 2002) is based on a similar technique implemented on plant stem (Sakuratani and Abe 1985; Senock and Ham 1993; Senock and Leuschner 1999). To install the gauges for the last month of the experiment, we carefully excavated horizontal roots as close as possible to the stem. After installation, Polyethylene and Styrofoam covered with aluminum foil was placed on the pit to minimize temperature fluctuations. Sap flow was recorded continuously for one month. At the end of the experiment (August–September 2012), zero sap flow was determined by carefully cutting both ends of the root and continued measurements for another day. Gauges were calibrated, using detached root sections of *B. indica* in the lab and measuring an artificial flow of water and determining 0 flow conditions. Due to technical reasons, likely a high temporal influence, only 2 from 12 gauges data-set could be analysed. Water flux in horizontal roots of *B. indica*. FRESH – fresh water irrigation, SALT – 100 mM NaCl irrigation from treatment side. Arrow points time of irrigation day. Saline irrigated roots show negative flow, or back-flow, whereas control show only positive flow. These results show that redistribution of water via horizontal roots in saline conditions is probable.